RP

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September 11, 1990
RP:0132

Mr. Manabu Tagomori, Deputy Director
Commission on Water Resource Management
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96822

Dear Mr. Tagomori:

Application for a Stream Channel Alteration Permit
Makakilo and Makalapa Gulches
Ewa, Oahu

The Environmental Center has reviewed the above document with the assistance of Paul Ekern, Hydrology; and Lee Lyttle, Environmental Center. The R.M. Towill Corporation proposes to construct two temporary diversions and one permanent stream alteration within Makakilo and Makalapa gulches. The open channels will be used to realign water flows in order to provide flood protection for the development of Kapolei Village, a master planned housing project.

Our reviewers expressed concern that the permit documentation lacked sufficient data to specify anticipated peak flow velocities. Lacking such specifications, it is not possible to assess the adequacy of the temporary channel designs. Our reviewers also questioned the practical feasibility of establishing rye/bermuda grass cover in the coralline substratum likely to be exposed through excavation of a channel having a 15 foot invert. They also noted that erosion in vegetation lined channels can vary significantly with different types of grass.

Additional information on permissible velocities for channels lined with vegetation is provided on the enclosed tables and figures from our reviewers' files.

Thank you for the opportunity to comment on this document, and we hope that you will find our comments helpful.

Yours truly,

John T. Harrison, Ph.D.
Environmental Coordinator

Enclosure
cc: OEQC
Roger Fujioka
Paul Ekern ✓
Lee Lyttle

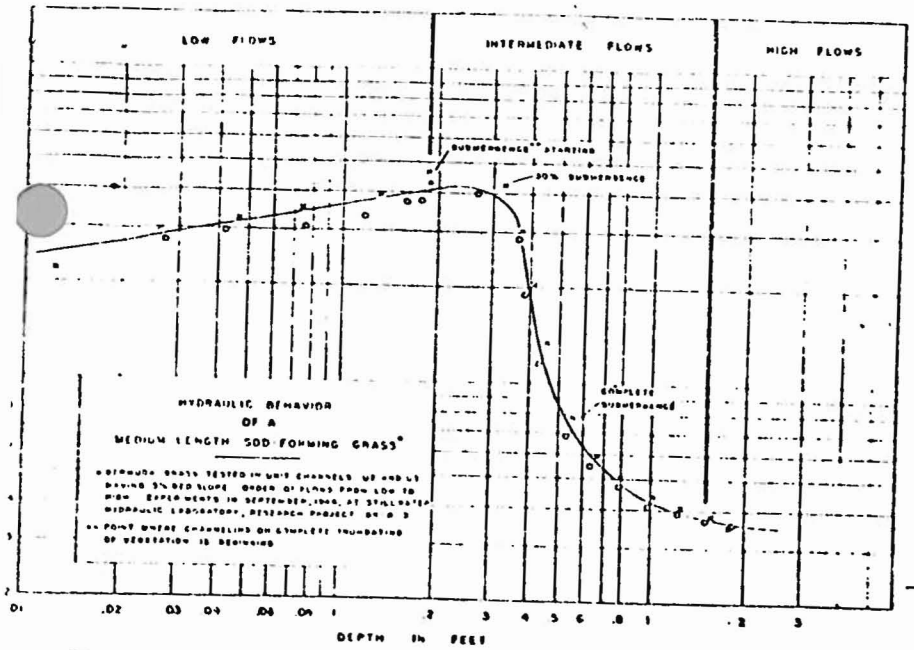

Fig. 5 This graph shows the behavior of a medium length, sod forming grass

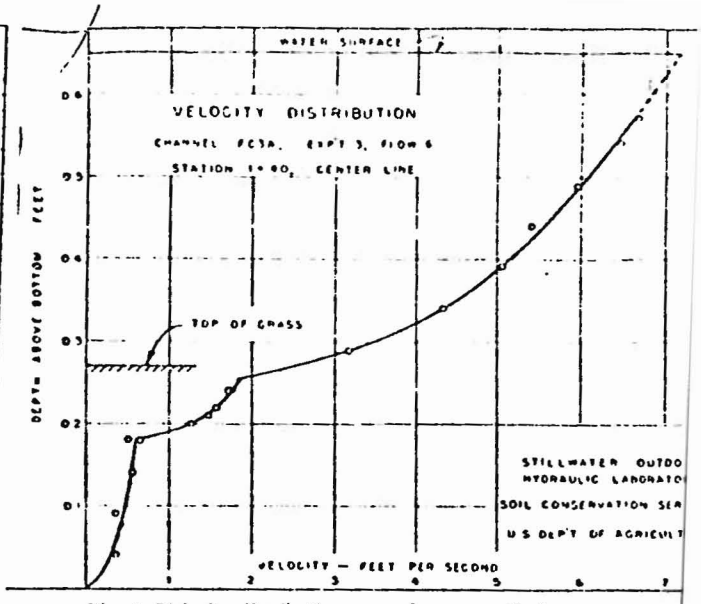

Fig. 5 Velocity distribution curve for one vertical traverse

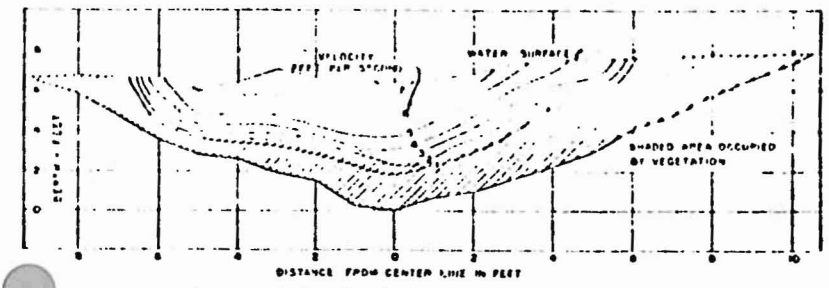

Fig. 6 Velocity distribution in a grass lined channel

TABLE 4. PERMISSIBLE VELOCITIES FOR CHANNELS LINED WITH VEGETATION

Cover	Slope range per cent	Permissible velocity, fps: Erosion resistant soils	Permissible velocity, fps: Easily eroded soils
Centipede grass	0-5	9	7
Bermuda grass, good turf kept mowed	5-10	8	6
	over 10	7	5
Bermuda grass	0-5	8	6
	5-10	7	5
	over 10	6	4
Buffalo grass Kentucky bluegrass	0-5	7	5
	5-10	6	4
Smooth brome Blue grama	over 10	5	3
Grass mixture	0-5	5	4
	5-10	4	3
	(Do not use on slopes steeper than 10 per cent)		
Lespedeza sericea Weeping lovegrass Ischaemum (Yellow bluestem.) Kudzu Alfalfa Crabgrass	0-5	3.5	2.5
	(Do not use on slopes steeper than 5 per cent, except for side slopes in a combination channel)		
Annuals, used on mild slopes or as temporary protection until permanent covers are established Common lespedeza Sudan grass	0-5	3.5	2.5
	(Use on slopes steeper than 5 per cent is not recommended)		

TABLE 3. CLASSIFICATION OF VEGETAL COVERS ACCORDING TO RETARDANCE

Retardance	Cover	Condition
A	Weeping lovegrass	Excellent stand, tall, (avg. 30 in)
	Ischaemum (yellow bluestem)	" " tall, (avg. 36 in)
	Kudzu	Very dense growth, uncut
	Bermuda grass	Good stand, tall (avg 12 in)
	Native grass mixture (little bluestem, blue grama, and other long and short midwestern grasses)	Good stand, unmowed
B	Weeping lovegrass	Good, stand, tall (avg 24 in)
	Lespedeza sericea	Good stand, not woody, tall (19 in)
	Alfalfa	Good stand, uncut (avg 11 in)
	Weeping lovegrass	Good stand, mowed (avg 13 in)
	Kudzu	Dense growth, uncut
	Blue grama	Good stand, uncut (avg 13 in)
C	Crabgrass	Fair stand, uncut (10-48 in)
	Bermuda grass	Good stand, mowed (avg 6 in)
	Common lespedeza	Good stand, uncut (avg 11 in)
	Grass mixture — summer (orchard grass, redtop, Italian ryegrass, and common lespedeza)	Good stand, uncut (6-8 in)
	Centipede grass	Very dense cover (avg 6 in)
	Kentucky bluegrass	Good stand, headed (6-12 in)
D	Bermuda grass	Good stand, cut to 2.5-in height
	Common lespedeza	Excellent stand, uncut (avg 4.5 in)
	Buffalo grass	Good stand, uncut (3-6 in)
	Grass mixture — fall, spring (orchard grass, redtop, Italian ryegrass, and common lespedeza)	Good stand, uncut (4-5 in)
		After cutting to 2 in height
	Lespedeza sericea	Very good stand before cutting
E	Bermuda grass	Good stand, cut to 1.5 in height
	Bermuda grass	Burned stubble

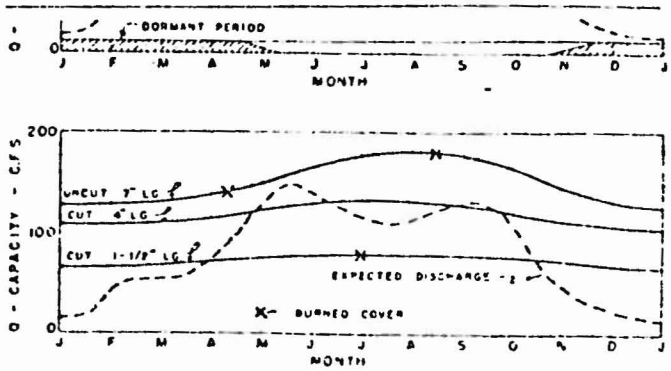

Fig. 7 The flow capacity of a Bermuda-grass-lined channel as influenced by season and maintenance practice: (A) (*Top*) Maximum possible capacity (capacity of channel if flowing full). (B) (*Bottom*) Maximum permissible capacity (capacity of channel if permissible velocity